Valence, Dominance, and Arousal as Organizing Principles of the Mental Lexicon

Bram Van Rensbergen, Simon De Deyne, Gert Storms
Laboratory of Experimental Psychology, University of Leuven, Belgium

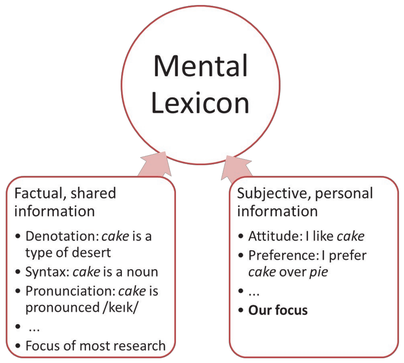
What we found:

A. When presented with a cue, participants respond with associations of similar valence, arousal, and dominance.

B. Connectivity in the mental lexicon can be used to estimate valence, arousal, and dominance

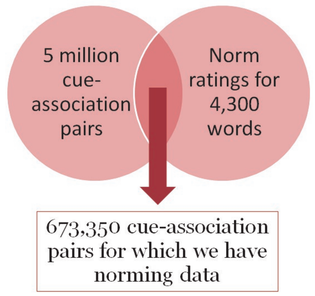
Introduction

- The mental lexicon contains a person's knowledge of words.
- Most research focuses on factual aspects of the lexicon.
- But what is the role of a subjective component in structuring the mental lexicon?

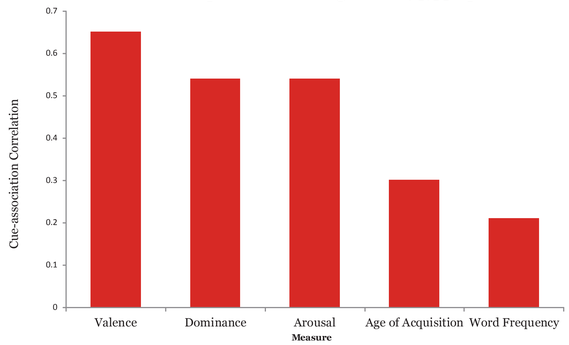


A. Cue-association correspondence on affective dimensions

- Known factors to influence connectivity in the mental lexicon:
  - Word frequency, age of acquisition (-> factual word covariates) (1, 2)
  - Valence (-> subjective) (3, 4)
- **How do subjective factors influence connectivity in the lexicon?**
- Factors we investigate:
  - Valence, dominance, arousal
    - Most important in differentiating subjective meaning (5)
  - Word frequency, age of acquisition
    - Nonsubjective, included for replication, and to compare effect sizes
- We use association data to investigate how these factors influence connectivity
- To investigate this: **What is the correspondence between cues and associations on these factors?**
- Approach: we combine two datasets
  - Large continued word association dataset (6)
  - Norm ratings gathered using a 7 point Likert scale (7)



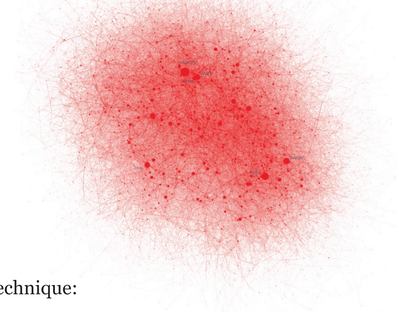
Cue-Association correspondence among these 673,350 pairs:



- **Conclusion**:
  - When presented with a cue, people tend to respond with associations of similar valence, dominance, and arousal
  - **—> Valence, dominance, and arousal strongly influence connectivity**
  - More so than age of acquisition and word frequency, two factors that have previously been demonstrated as important to connectivity

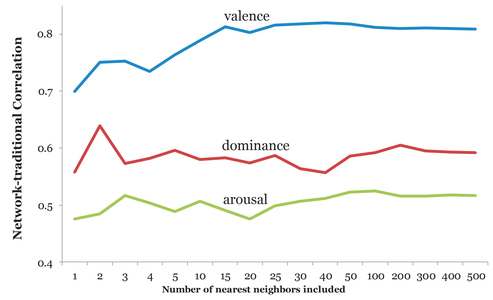
B. Deriving affective ratings from network connectivity

- In A., we saw that subjective factors strongly influence connectivity in the mental lexicon
- Question arises: **Can we use connectivity in the mental lexicon to estimate subjective meaning**?
- We use word association data to construct a large semantic network (6)



- Technique:
  - Look at the position of a concept in the network
  - Look at the position of certain anchor points
    - 'good' and 'bad' for valence, 'strong' and 'weak' for dominance, 'active' and 'passive' for arousal
  - Use similarity to those anchor points as a measure on the corresponding dimension
    - We use a cosine measure of similarity (8)
    - Here, this refers to overlap in associations
  - This measure can include any number of the nearest neighbors of the anchor points
    - NN: the nodes with the highest cosine similarity to the anchor points (out of all nodes in the network)
- We use this technique to estimate valence, dominance, and arousal for 3,762 Dutch words
  - We do this for up to 500 nearest neigbors for each anchor point
- We have Likert ratings for these 3,762 words (7)
- We correlate the Likert ratings with estimates using the words' position in the semantic network

Valence, dominance, and arousal derived from network connectivity correspond to traditional ratings:



- Conclusion:
  - **Valence, dominance, and arousal can be predicted using concepts' position in a semantic network**
  - These estimates show medium to high correlations with Likert ratings
  - These correlations increase when more of the anchor points nearest neighbors are included, plateaus at about 200

General Conclusion

- Valence, dominance, and arousal strongly influence connectivity in the mental lexicon
- We can derive estimates of valence, dominance, and arousal using a concept's position in a semantic network
- —> These subjective factors play an important role as organizing principles of the mental lexicon

References

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Further information

Please contact *bram.vanrensbergen@ppw.kuleuven.be*.